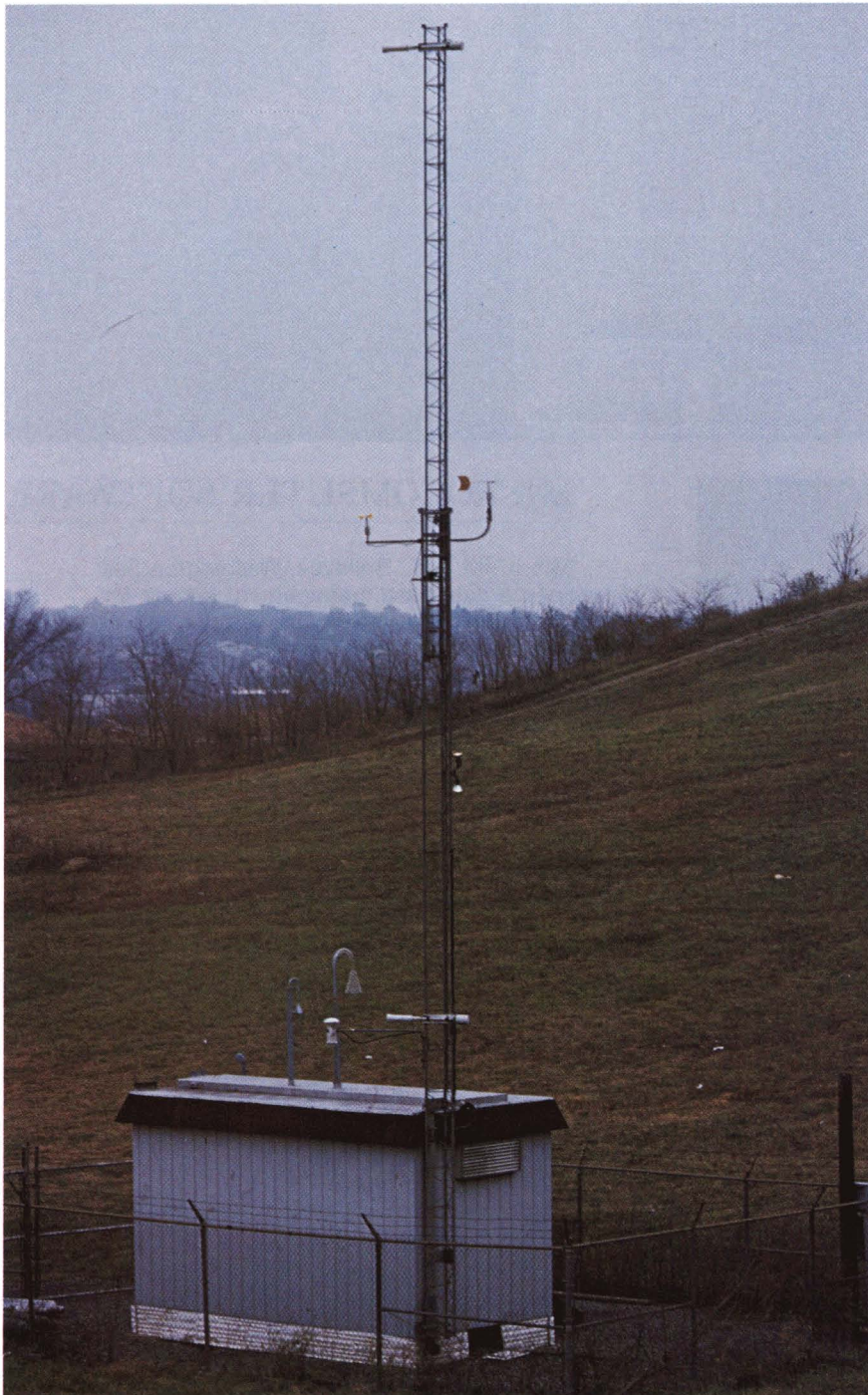


SPACE-DERIVED AIR MONITOR

An air pollution surveillance system based on space sensors and telemetry leads a sampling of environment-improving spinoffs



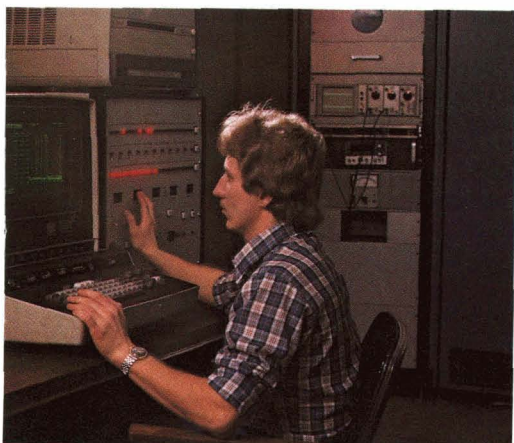
Air monitoring systems play an important part in the national quest for improving the quality of the air we breathe. Operated for the most part by federal, state and local governments, in some cases by industrial firms, these systems help assure compliance with air quality standards, aid in formulation of regulations and control measures, and provide warning when air pollution exceeds acceptable levels.

One particularly effective system is COPAMS, an acronym for Commonwealth of Pennsylvania Air Monitoring System. Developed for Pennsylvania's Department of Environmental Resources by General Electric Company's Space Systems Division, Valley Forge, Pennsylvania, COPAMS is a spinoff from space research.

Much of the technology in COPAMS derives from GE's experience in building unmanned spacecraft, in particular NASA's Nimbus satellites. NASA launched seven Nimbus spacecraft, five of them prior to the COPAMS project, in a program aimed at development of advanced technology for weather forecasting and environmental studies. In addition to cameras for cloud cover photography, they carried experimental sensors to

This is one of 17 remote units in the Commonwealth of Pennsylvania Air Monitoring System (COPAMS). Air intakes on the roof of the station send sample air to sensors that measure pollutants in the atmosphere, and instruments on the antenna tower simultaneously report weather data.

Every minute the COPAMS stations report their data to this central station in the state capital, where a computer processes, displays and stores the information. Console warning lights indicate pollution levels beyond prescribed limits.



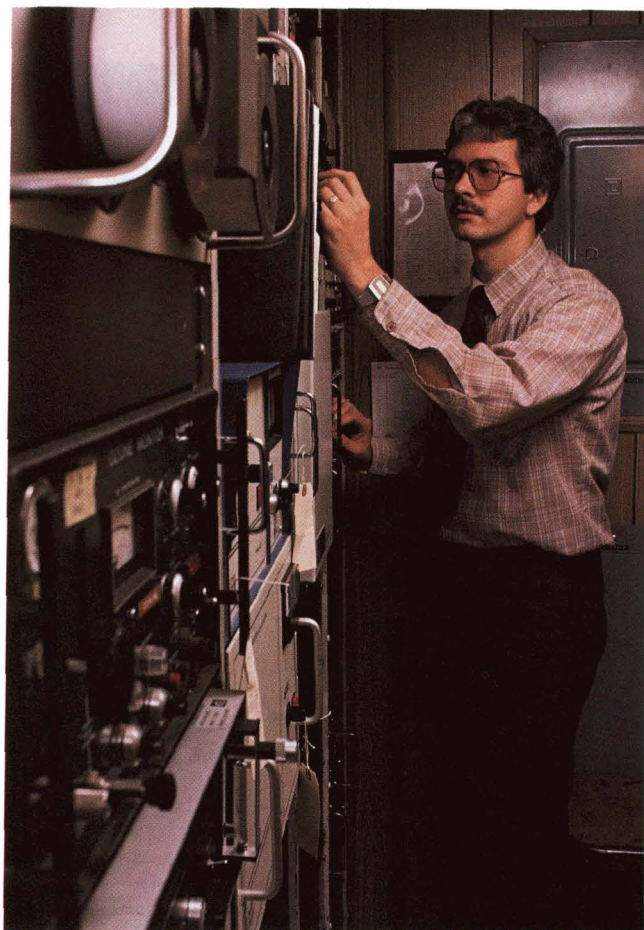
measure such atmospheric variables as temperature, pressure, ozone and water vapor, along with instruments for studying solar radiation in the atmosphere. Their findings were relayed to Earth by telemetry, a process whereby instrument data is converted to electrical signals that are sent to a receiver on the ground and there reconverted to usable information. These technologies, telemetry and atmospheric sensing, formed the basis for COPAMS.

COPAMS is a network of 17 data acquisition units, located in as many Pennsylvania cities,

continuously feeding information to a central station in the capital city of Harrisburg. Each remote station automatically measures and records the levels of pollutants in the atmosphere and additionally senses wind speed, wind direction, temperature, dew point and other meteorological variables. Sensor readings from the remote units are transmitted every minute to the central station, along with a status report on how the outlying unit's equipment is performing. The data reporting process is essentially telemetry, but it differs from space telemetry in one respect: in space, data is necessarily sent to Earth by radio, but in COPAMS the information is transmitted over dedicated telephone party lines to reduce operating costs.

At the central station in Harrisburg, a computer digests the flow of data from the outlying units, processes it and displays the results on video terminals, magnetic tape and printed readouts. Pollution levels are computer-compared with prescribed limits. When the concentration of pollutants is below the regulatory limit, the system illuminates—on an operations panel at the central station—a coded status lamp showing the letter N, for normal. When conditions are abnormal, an A (alert), W (warning) or E (emergency) lights up and a horn signals the need to initiate control procedures. The whole COPAMS system works automatically, including self checking equipment that reports malfunctions when they occur. However, operators periodically review printed readouts and there are provisions whereby an operator at the central station can send special commands to the outlying units, allowing human control during pollution emergencies.

COPAMS is supplemented by a second network—called PAQSS, for Pennsylvania Air Quality Surveillance System—consisting of several microprocessor-controlled air sampling modules. These modules continuously monitor two or three air pollution factors and record the data on magnetic tape for forwarding to Harrisburg and integration into the data base.



An interior view of a COPAMS remote station, which normally operates unattended but requires periodic equipment checks. In addition to gathering pollution and weather information, the system also monitors its own operation and alerts the central station when a malfunction occurs.